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June 232, 2005

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Re: **CERTIFICATE OF CORRECTION**
U. S. Letters Patent No. 6,853,654
Issued: February 8, 2005
For: TUNABLE EXTERNAL CAVITY LASER
Inventor: McDonald
Our File No. 42390.P14868x

Dear Sir:

Enclosed is the Certificate of Correction (two copies) for the above-referenced patent.

This request for correction is made under rule 322 of the Rules of Practice and 35 U.S.C. Section 254.

Find enclosed a copy of the allowed claims and the Notice of Allowability dated September 24, 2004.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Edwin H. Taylor
Reg. No. 25,129

EHT/cgb
Enclosures

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,853,654

DATED : February 8, 2005

INVENTOR(S) : McDonald

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Delete claims 1-77 and insert the attached set of claims.

MAILING ADDRESS OF SENDER

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN
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PATENT NO. 6,853,654

Certificate of Correction (PTO Form 1050)-Amended

AUG 9 - 2005

AUG 0 1 2005 PATENT & TRADEMARK OFFICE

Notice of Allowability	Application No. 10/099,649	Applicant(s) MCDONALD ET AL.	
	Examiner Cornelius H. Jackson	Art Unit 2828	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address*--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the Amendment filed 18 August 2004*.
2. ☒ The allowed claim(s) is/are *1,2,8-35,40,43-50 and 55-77*.
3. ☒ The drawings filed on *24 November 2003* are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. ____.
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
   1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 8/10/04
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date ____.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other ____.

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DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 18 August 2004 has been entered.

2. Acknowledgment is made that applicant's Amendment, filed on 18 August 2004, has been entered. Upon entrance of the Amendment, claims 1, 11, 12, 14, 16-35, 43-46, 59 and 55-65 were amended, claims 41 and 51-54 were canceled and claims 67-77 were added. Claims 1, 2, 8-35, 40, 43-50 and 55-77 are now pending in the current application.

Allowable Subject Matter

3. Claims 1, 2, 8-35, 40, 43-50 and 55-77 are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cornelius H. Jackson whose telephone number is

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(571)272-1942. The examiner can normally be reached on 8:00 - 5:00, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CHJ
chj

MINSUN OH HARVEY
PRIMARY EXAMINER

AUG 9 - 2005

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Patent

FIRST CLASS CERTIFICATE OF MAILING			
I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.			
August 16, 2004	Yuko Tanaka		
Date Mailed	Name	Signature	Date

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
McDonald et al.	Examiner: Jackson, Cornelius
Serial No. 10/099,649	Art Unit: 2828
Filed: March 15, 2002	
For: TUNABLE EXTERNAL CAVITY LASER	

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE

Sir:

A notice of allowance in the above-identified application was mailed on May 14, 2004. The Applicant requests the Examiner to enter the following amendments and to consider the following remarks. This Amendment and Response is provided as a submission required under 37 C.F.R. § 1.114 for a request for continued examination (RCE) filed herewith.

AMENDMENTS TO THE SPECIFICATION

Please replace paragraph [0001] with the following amended paragraph.

[0001] This application is a continuation-in-part of U.S. Patent Application Serial No. 09/626,526, filed July 27, 2000, pending, which claims the benefit of U.S. Provisional Application 60/145,831 filed July 27, 1999; and is entitled to the benefits of ~~U.S. Provisional Application 60/145,831, filed on July 27, 1999,~~ U.S. Provisional Application No. 60/276,645, filed March 16, 2001, U.S. Provisional Application No. 60/276,813, filed March 16, 2001, U.S. Provisional Application Serial No. 60/276,643, filed March 16, 2001, U.S. Provisional Application No. 60/276,760, filed March 16, 2001 and U.S. Provisional Application Serial No. 60/276,646, filed March 16, 2001, the disclosures of which are incorporated herein by reference.

1. An apparatus, comprising:

a first tunable wavelength selection element configured to define a first plurality of tunable transmission peaks separated by a first adjustable free spectral range, the first plurality of tunable transmission peaks within a gain bandwidth of a gain medium optically couplable to the optical tuning apparatus;

a second tunable wavelength selection element configured to define a second plurality of tunable transmission peaks separated by a second adjustable free spectral range, the second plurality of tunable transmission peaks within the gain bandwidth of the gain medium; and

a controller, operatively coupled to each of the first and second tunable wavelength selection elements, to adjust the first and second free spectral ranges to produce at least one tunable joint transmission peak, wherein each of said at least one tunable joint transmission peak comprises a respective pair of transmission peaks, one from each of the first and second plurality of tunable transmission peaks, that are aligned, and said at least one tunable transmission peak is tuned using a Vernier tuning effect.

2. The apparatus of claim 1, wherein said at least one joint transmission peak is adjustable according to tuning of said first and second tunable wavelength selection elements.

3. The apparatus of claim 1, wherein said first and second tunable wavelength selection elements comprise at least one etalon.

4. The apparatus of claim 1, wherein said first and second tunable wavelength selection elements comprise at least one grating.

5. The apparatus of claim 1, wherein said first and second tunable wavelength selection elements comprise first and second etalons.

6. The apparatus of claim 5, wherein at least one of said first and second etalons is a tunable air gap etalon.

7. The apparatus of claim 1, wherein the first and second tunable wavelength selection elements are configured in a birefringent etalon.

8. The apparatus of claim 5, wherein at least one of said first and second etalons is angle tuned.

9. The apparatus of claim 5, wherein at least one of said first and second etalons comprises a wedge-shaped etalon that is positioned via a micro-electro-mechanical systems (MEMS) actuator.

10. The apparatus of claim 5, wherein at least one of said first and second etalons includes first and second surfaces, each said surface having at least one quarter wave dielectric pair layer thereon.

11. The apparatus of claim 1, further comprising a beam splitter positioned in a light beam generated by the gain medium, the beam splitter positioned before the first and second tunable wavelength selection elements, the beam splitter to pass a first light beam to the first tunable_wavelength selection element and to pass a second light beam to the second tunable wavelength selection element.

12. The apparatus of claim 5, wherein said controller comprises a thermal controller, wherein the first and second etalons are thermo-optically tunable.

13. The apparatus of claim 1, wherein a rear facet of the gain medium and a reflector optically couplable to the gain medium define an external laser cavity of the apparatus, wherein the external laser cavity serves as the second tunable wavelength selection element.

14. A laser apparatus, comprising

a base;

a gain medium, operatively coupled to the base, to emit a light beam in response to an electric input;

a first tunable wavelength selection element operatively coupled to the base and positioned in the light beam, configured to define a first plurality of tunable transmission peaks having a first adjustable free spectral range, the first plurality of tunable transmission peaks within a gain bandwidth of the gain medium;

a second tunable wavelength selection element operatively coupled to the base and positioned in the light beam, configured to define a second plurality of tunable transmission peaks having a second adjustable free spectral range, the second plurality of tunable transmission peaks within the gain bandwidth of the gain medium; and

a controller, operatively coupled to each of the first and second tunable wavelength selection elements, to tune a wavelength of an optical output produced by the laser apparatus by concurrently adjusting the first and second free spectral ranges of the first and second tunable wavelength selection elements to define a single joint transmission peak within a selectable wavelength range and adjustable in phase according to tuning of said first and second tunable wavelength selection elements.

15. The laser apparatus of claim 14, wherein the gain medium comprises a laser diode having first and second facets defining an internal cavity having a free spectral range and emitting the light beam from the first facet.

16. The laser apparatus of claim 15, further comprising a reflective element positioned in said light beam after the first and second tunable wavelength selection elements, the reflective element and the second facet of the gain medium defining an external cavity.

17. The laser apparatus of claim 15, wherein the first tunable wavelength selection element has a first free spectral range that is approximately equal to a multiple of the free spectral range of the gain medium.

18. The laser apparatus of claim 15, wherein the second tunable wavelength selection element has a second free spectral range that is approximately equal to a multiple of the free spectral range of the gain medium.

19. The laser apparatus of claim 15, wherein the selectable wavelength range is at least as great as a gain bandwidth of said gain medium.

20. The laser apparatus of claim 14, wherein said first and second tunable wavelength selection elements comprise at least one etalon.

21. The laser apparatus of claim 14, wherein said first and second tunable wavelength selection elements comprise at least one grating.

22. The laser apparatus of claim 14, wherein said first and second tunable wavelength selection elements comprise first and second tunable etalons.

23. The laser apparatus of claim 22, wherein at least one of said first and second tunable etalons is thermo-optically tunable.

24. The laser apparatus of claim 22, wherein at least one of said first and second tunable etalons is electro-optically tunable.

25. The laser apparatus of claim 22, wherein at least one of said first and second tunable etalons is angle tuned.

26. The laser apparatus of claim 22, wherein at least one of said tunable etalons comprises a semiconductor material.

27. The laser apparatus of claim 22, wherein at least one of said tunable etalons includes first and second surfaces, each said surface having at least one quarter wave dielectric pair layer thereon.

28. The laser apparatus of claim 26, wherein said tunable etalon includes a thermal control element integrated thereon.

29. The laser apparatus of claim 23, wherein said tunable etalon is operatively coupled to a thermal controller.

30. The laser apparatus of claim 23, wherein said tunable etalon is operatively coupled to a thermal reservoir.

31. A method for tuning a light beam, comprising:

positioning a first tunable wavelength selection element in the light beam generated by a gain medium, the first tunable wavelength selection element configured to define a first plurality of tunable transmission peaks having a first adjustable free spectral range, the first plurality of tunable transmission peaks within a gain bandwidth of the gain medium;

positioning a second tunable wavelength selection element in the light beam, the second tunable wavelength selection element configured to define a second plurality of tunable transmission peaks having a second adjustable free spectral range, the second plurality of tunable transmission peaks within the gain bandwidth of the gain medium; and

concurrently tuning the first and second tunable wavelength selection elements to align one of the first plurality of transmission peaks with one of the second plurality of transmission peaks via a Vernier tuning effect to define a single joint transmission peak.

32. The method of claim 31, further comprising:

emitting the light beam from a first facet of the gain medium; and

positioning a reflective element in the light beam after the first and second tunable wavelength selection elements, the reflective element and a second facet of the gain medium defining an external laser cavity.

33. The method of claim 32, wherein the second tunable wavelength selection element is defined by the external laser cavity.

34. The method of claim 31, further comprising splitting the light beam into a first light beam to pass through the first tunable wavelength selection element and into a second light beam to pass through the second tunable wavelength selection element.

35. The method of claim 31, further comprising positioning a third tunable wavelength selection element in the light beam defining a third plurality of tunable transmission peaks to provide a triple Vernier tuning effect to define the single joint transmission peak.

36. The method of claim 31, wherein:

positioning the first tunable wavelength selection element comprises positioning a first tunable etalon in the light beam; and

positioning the second tunable wavelength selection element comprises positioning a second tunable etalon in the light beam.

37. The method of claim 36, wherein concurrently tuning the first and second tunable wavelength selection elements comprises thermo-optically tuning the first and second tunable etalons.

38. The method of claim 37, wherein said thermo-optically tuning comprises:

thermally adjusting a refractive index of the first tunable etalon; and

thermally adjusting a refractive index of the second tunable etalon.

39. The method of claim 38, wherein said thermo-optically tuning further comprises:

thermally adjusting a physical thickness of the first tunable etalon; and

thermally adjusting a physical thickness of the second tunable etalon.

40. The apparatus of claim 1, further comprising a third tunable wavelength selection element to provide a triple Vernier tuning effect.

41. The apparatus of claim 1, wherein the first adjustable free spectral range (FSR_1) is related to the second adjustable free spectral range (FSR_2) by the equation:

$$FSR_1 \approx (M/M \pm N)(FSR_2)$$

wherein M is the total number of tunable wavelengths within a selected wavelength range, and N is a non-integer or integer number that is selectable.

42. The apparatus of claim 1, wherein each of the first and second adjustable free spectral ranges are greater than a wavelength channel spacing in a communication grid to which the apparatus may be tuned.

43. The apparatus of claim 1, wherein the apparatus enables continuous, selective wavelength tuning over a wide wavelength range in a manner that is independent of a fixed, pre-determined wavelength grid.

44. The laser apparatus of claim 14, further comprising a third tunable wavelength selection element operatively coupled to the base and positioned in the light beam to provide a triple Vernier tuning effect.

45. The laser apparatus of claim 14, wherein the first adjustable free spectral range (FSR_1) is related to the second adjustable free spectral range (FSR_2) by the equation:

$$FSR_1 \approx (M/M \pm N)(FSR_2)$$

wherein M is the total number of tunable wavelengths within a selected wavelength range, and N is a non-integer or integer number that is selectable.

46. The laser apparatus of claim 14, wherein each of the first and second adjustable free spectral ranges are greater than a wavelength channel spacing in a communication grid to which the laser apparatus may be tuned.

47. The laser apparatus of claim 14, wherein the apparatus enables continuous, selective wavelength tuning over a wide wavelength range in a manner that is independent of a fixed, pre-determined wavelength grid.

48. A laser apparatus, comprising

a base;

a reflector, operatively coupled to the base;

a gain medium, operatively coupled to the base, having a first facet from which a light beam is emitted in response to an electric input and a second facet opposite the first facet, the second facet and the reflector defining an external laser cavity having a first adjustable free spectral range and providing a plurality of lasing modes having a first plurality of transmission peaks within a gain bandwidth of the gain medium; and

a tunable wavelength selection element operatively coupled to the base and positioned between the first facet and the reflector, configured to define a second plurality of tunable transmission peaks having a second adjustable free spectral range, the second plurality of tunable transmission peaks within the gain bandwidth of the gain medium,

wherein the first adjustable free spectral range is related to the second adjustable free spectral range such that the first and second plurality of transmission peaks may be adjusted to generate a tunable joint transmission peak via a Vernier tuning effect.

49. The laser apparatus of claim 48, wherein the tunable wavelength selection element comprises an etalon.

50. The laser apparatus of claim 48, wherein the first adjustable free spectral range (FSR_1) is related to the second adjustable free spectral range (FSR_2) by the equation:

$$FSR_1 \approx (M/M \pm N)(FSR_2)$$

wherein M is the total number of tunable wavelengths within a selected wavelength range, and N is a non-integer or integer number that is selectable.

51. The laser apparatus of claim 48, wherein the tunable wavelength selection element comprises a wedge-shaped etalon that is positioned via a micro-electro-mechanical systems (MEMS) actuator.

52. The laser apparatus of claim 14 wherein the second tunable wavelength selection element comprises a wedge-shaped etalon, the wedge-shaped etalon coupled to hinge elements and to electrode elements to position the wedge-shaped etalon in the light beam.

53. The laser apparatus of claim 14, further comprising a beam splitter positioned in the light beam before the first and second tunable wavelength selection elements, the beam splitter to pass a first light beam to the first tunable wavelength selection element and to pass a second light beam to the second tunable wavelength selection element.

54. The laser apparatus of claim 14 wherein at least one of the first and second tunable wavelength selection elements comprises a tunable air gap etalon.

55. The laser apparatus of claim 54 wherein the tunable air gap etalon to provide feedback to the gain medium for wavelength selection.

56. The laser apparatus of claim 14 wherein the first and second tunable wavelength selection elements are included in a birefringent etalon.

57. The laser apparatus of claim 16 wherein the external cavity serves as the second tunable wavelength selection element.

58. A laser apparatus, comprising:

a reflector;

a gain medium including a first facet from which a light beam is emitted in response to an electric input and a second facet opposite the first facet, the second facet and the reflector defining an external laser cavity;

a first tunable wavelength selection element positioned between the first facet and the reflector, configured to define a first plurality of tunable transmission peaks having a first adjustable free spectral range, the first plurality of tunable transmission peaks within the gain bandwidth of the gain medium,

a second tunable wavelength selection element positioned between the first tunable wavelength selection element and the reflector, configured to define a second plurality of tunable transmission peaks having a second adjustable free spectral range, the second plurality of tunable transmission peaks within the gain bandwidth of the gain medium; and

a third tunable wavelength selection element positioned between the second tunable wavelength selection element and the reflector, configured to define a third plurality of tunable transmission peaks having a third adjustable free spectral range, the third plurality of tunable transmission peaks within the gain bandwidth of the gain medium,

wherein the first, second and third plurality of transmission peaks may be adjusted to generate a tunable joint transmission peak via a triple Vernier tuning effect.

59. The laser apparatus of claim 58 wherein the second wavelength selection element comprises an etalon.

60. The laser apparatus of claim 58 wherein the second wavelength selection element comprises a wedge-shaped etalon that is positioned via a micro-electro-mechanical systems (MEMS) actuator.

61. The laser apparatus of claim 58 wherein the third wavelength selection element comprises an etalon.

62. The laser apparatus of claim 58 wherein the third wavelength selection element comprises an electro-optic material with a voltage-dependent index of refraction.